

REMARKS:

In view of the foregoing remarks and the foregoing amendments, reconsideration and allowance are respectfully requested.

We have amended independent claims 1, 13, and 33 to replace "electrically actuated displacement device" with --piezoelectric actuator--, which was previously recited in dependent claim 16 (now canceled). We have also amended several of the dependent claims so as to be consistent with the amendments to these independent claims and to provide proper antecedent basis.

Interview Summary

The applicant thanks Examiner Nguyen for the April 26, 2006 interview between Examiner Nguyen, co-applicant Mel Biggs, and applicant's attorneys Frank Occhiuti and Erin Henson. During the interview, the propriety of the rejection of the claims as anticipated by the Fujii patent (U.S. 5,668,579) was discussed.

Prior Art Rejections

Independent Claims 1 and 13

The Examiner rejected claims 1 and 13 under 35 U.S.C. 102(b) as anticipated by Fujii. Applicants respectfully traverse. We submit that Fujii does not describe or suggest an [a]pparatus comprising a plurality of droplet ejection devices, each said droplet ejection device including: a fluid chamber having a volume and an ejection nozzle, a piezoelectric actuator that moves between a displaced position and an undisplaced position....," as recited in independent claims 1 and 13 (emphasis added). Rather, Fuji describes an electrostatic actuator. Fujii states throughout the specification that the invention relates to electrostatic force. For example, Fujii explains that "the present invention was accomplished in order to solve the problem to be solved for applying electrostatic actuators to practical ink jet printer heads." (Col. 25, lines 33-36, emphasis added) While the Examiner cites Fujii as disclosing a piezoelectric actuator, Fujii actually teaches away from using piezoelectric devices as evidenced by the passage below:

...the process of bonding the piezoelectric chip to the diaphragms used to produce pressure in the pressure chamber is complex. With current ink jet recording apparatuses having plural nozzles and a high nozzle density to meet the demand for high speed, high quality printing, these piezoelectric devices must be precisely manufactured and bonded to the diaphragms, processes that are extremely complicated and time-consuming. (Col. 1, lines 39-47, emphasis added)

The properties of piezoelectric devices are different from electrostatic actuators. For example, Fig. 35 in Fujii shows the nonlinear relationship between diaphragm displacement and the electrostatic capacity of the actuator. In an electrostatic printhead, the capacitance of an electrostatic actuator increases as the displacement of the diaphragm increases. Conversely, with a piezoelectric device, the capacitance of a piezoelectric device remains substantially constant as the displacement of a diaphragm increases.

Accordingly, applicants submit that claim 1 and 13 are not anticipated and respectfully requests that the rejection under 35 U.S.C. 102(b) be withdrawn. Furthermore, because claims 2-6, 8-15, 20-21, and 27 depend from claims 1 and 13, these dependent claims are not anticipated for at least the same reason that independent claims 1 and 13 are not anticipated.

Dependent claims 7, 17-19, 22-26, and 29

The Examiner rejected claims 7, 17-19, 22-26, and 29 under 35 U.S.C. 103(a) as allegedly being unpatentable over Fujii et al. (US 5,668,579) in view of Murakami et al. (US 4,563,689). The Examiner acknowledges that Fujii fails to disclose that a single resistance is used to charge and discharge a respective capacitance; said first control signals are controlled to provide uniform droplet volumes or velocities from said plurality of droplet ejection devices or to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide gray scale control. Fujii also does not disclose wherein said first and second control signals are controlled to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide gray scale control.

The Examiner also recognizes that Fujii does not describe wherein said first control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device; wherein said first and second control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device; wherein said first control signals are controlled to inject noise into images being printed so as to break up possible print patterns and banding; wherein said first and second control signals are controlled to vary the amplitude of charge as well as the length of time of charge on said piezoelectric actuator for the first droplet out of a droplet ejection device so as to match subsequent droplets; and wherein said controller controls said first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency.

The Examiner, however, cites Murakami as disclosing the features found to be lacking in Fujii. Applicants submit that a person of ordinary skill in the art would not combine Fujii and Murakami to disclose an "Apparatus comprising a plurality of droplet ejection devices, each said droplet ejection device including: a fluid chamber having a volume and an ejection nozzle, a piezoelectric actuator that moves between a displaced position and an undisplaced position...." As discussed above in conjunction with independent claims 1 and 13, Fujii teaches away from using piezoelectric devices. Specifically, Fujii states that "With current ink jet recording apparatuses having plural nozzles and a high nozzle density to meet the demand for high speed, high quality printing, these piezoelectric devices must be precisely manufactured and bonded to the diaphragms, processes that are extremely complicated and time-consuming." (Col. 1, lines 39-47)

Accordingly, applicants submit that claims 7, 17-19, 22-26, and 29 are not obvious and request that the rejection under 35 U.S.C. 103 be withdrawn.

Dependent claim 28

The Examiner also rejected dependent claim 28 under 35 U.S.C. 103(a) as allegedly being unpatentable over Fujii et al. (US 5,668,579) in view of Murakami et al. (US 4,563,689), as applied to claims 1 and 13, and further in view of Imanaka et al. (US 6,467,863) and Butterfield et al. (US 6,685,297). The Examiner acknowledges that both Fujii and Murakami fail

to disclose wherein said controller mounted to a monolithic body in which said fluid chambers are formed, but cites Butterfield as disclosing this feature. Applicants submit that a person of ordinary skill in the art would not combine Fujii, Murakami, Imanaka, and Butterfield to disclose an "Apparatus comprising a plurality of droplet ejection devices, each said droplet ejection device including: a fluid chamber having a volume and an ejection nozzle, a piezoelectric actuator that moves between a displaced position and an undisplaced position...." As discussed above, we submit that Fujii teaches away from using piezoelectric devices.

Accordingly, applicants submit that claim 28 is not obvious and request that the rejection under 35 U.S.C. 103 be withdrawn.

Independent Claim 30

The Examiner rejected claim 30 under 35 U.S.C. 102(b) as anticipated by Fujii. Applicants respectfully traverse. Independent claim 30 recites a method to control a response of a droplet ejection device comprising...a piezoelectric actuator. Fujii does not disclose a piezoelectric actuator, rather Fujii specifically refers to an electrostatic actuator.

Accordingly, applicants submit that claim 30 is not anticipated and respectfully requests that the rejection under 35 U.S.C. 102(b) be withdrawn. Furthermore, because claims 31-32 depend from claim 1, these dependent claims are not anticipated for at least the same reason that independent claim 30 is not anticipated.

Independent Claim 33

The Examiner reject claim 33 under 35 U.S.C. 102(b) as anticipated by Fujii. Applicants respectfully traverse. Amended independent claim 33 recites a "method for dispensing fluid for a plurality of droplet ejection devices, the method comprising...moving a piezoelectric actuator." Fujii does not disclose a piezoelectric actuator, rather Fujii specifically refers to an electrostatic actuator.

Accordingly, applicants submit that claim 33 is not anticipated and respectfully requests that the rejection under 35 U.S.C. 102(b) be withdrawn. Furthermore, because claims 34-35 depend from claim 33, these dependent claims are not anticipated for at least the same reason that independent claim 33 is not anticipated.

Conclusion

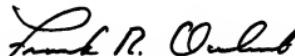
In view of the amendments and remarks herein, the Applicants believe that Claims 1-15 and 17-35 are in condition for allowance and ask that these pending claims be allowed. The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence with other positions of the Examiner that have not been explicitly contested.

Accordingly, the arguments for patentability of a claim should not be construed as implying that there are not other valid reasons for patentability of that claim or other claims.

No fee is believed due at this time. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: May 3, 2006



Frank R. Occhiuti
Reg. No. 35,306

Fish & Richardson P.C.
225 Franklin Street
Boston, MA 02110-2804
Telephone: (617) 524-5070
Facsimile: (617) 542-8906